Heavy metal concentrations in the soils and shrubs near a metal processing plant in Peninsular Malaysia.

ABSTRACT

Industrial areas pose pollution risks because the emissions of heavy metals from these sources are normally high. This study was conducted to determine the concentrations of selected heavy metals (zinc, chromium and copper) in the soils and leaves of a shrub species, Melastoma malabathricum around a metal processing plant. Soil samples were taken in three directions away from the source. After soil digestion using the aqua regia method, the total concentration of each heavy metal was determined using Atomic Absorption Spectrometer (AAS). Leaf samples were taken from one plant per location whenever available. Prior to heavy metal determination using AAS, the foliar samples were prepared using the dry ash method. Results showed that heavy metal concentrations were lowest in the northeast direction, where the wind was blowing for most of the time, but for only a short distance (<600 m) from the source. It is suggested that inputs from other sources, e.g., vehicles and agricultural activities also increased the total heavy metal concentrations in the soils. When compared to general heavy metal concentrations in soils (Alloway, 1990), the zinc and copper concentrations in this study were in the low range (below critical soil total concentration), but chromium concentrations were varied (low to high range). The results for foliar heavy metal concentrations showed no clear pattern between the soil total and plant concentrations for zinc. For chromium and copper, foliar heavy metal concentrations were higher than the soil total concentrations for three locations (5 km northeast, 5 km north and 100 m east). Two locations, however, showed the opposite patterns. When compared to the general foliar heavy metal concentrations (Alloway, 1990), foliar zinc concentrations in the study were below the critical concentration as did most of the foliar copper concentrations, but foliar chromium concentrations were higher than the critical concentrations where toxicity effects might have been likely. But the sampled M. malabathricum plants did not show any visible sign of foliar injury. Nonetheless, M. malabathricum showed a capacity for Cr, Cu and Zn uptake regardless of the soil total concentrations of these heavy metals. This study provides important information on the state of heavy metal pollution in lowland soils and plants of Peninsular Malaysia.

Keyword: Industrial; Pollution; Emissions; Samples; Determination; Concentrations; Agricultural; Metals; Spectrometer; Sources; Malabathricum.